

**PENTAMYZUS HILLE RIS LAMBERS, A NEOTROPICAL GENUS OF THE
TRIBE MACROSIPHINI (HEMIPTERA: APHIDIDAE: APHIDINAE), WITH
THE DESCRIPTION OF A NEW SPECIES**

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Abstract.—*Pentamyzus fueguinus*, n. sp., is described and two little-known South American species of *Pentamyzus*, *P. tenuis* and *P. acaenae*, are studied from aphids caught in Tierra del Fuego (Argentina). Considering that *Pentamyzus* is one of the few genera of Macrosiphini in the Neotropical Region, we present several hypothesis about its evolution in the subcontinent.

Resumen.—A partir de pulgones capturados en Tierra del Fuego (Argentina) se describe *Pentamyzus fueguinus* n. sp. y se estudian otras dos especies sudamericanas poco conocidas: *P. tenuis* y *P. acaenae*. Aprovechando que *Pentamyzus* es uno de los pocos géneros de Macrosiphini con representación neotropical se analizan varias hipótesis sobre su historia evolutiva en el subcontinente.

Key Words: *Pentamyzus*, Aphididae, Macrosiphini, aphid evolution, new species, Tierra del Fuego, Argentina

Macrosiphini (Aphidinae) is the richest tribe both in species and genera in the family Aphididae (Remaudière and Remaudière 1997, Eastop 1998) and it is very difficult to subdivide it into subtribes "because speciation in a great scale has taken place during a rather short time rather recently" (Heie 1992). The tribe Macrosiphini is poorly represented in the Neotropical Region and most of its species recorded in this region are allochthonous (Smith and Cermeli 1979, Nieto Nafría et al. 1994). Autochthonous Neotropical species belong to the genera *Micropersus* Patch 1908 (several species), *Uroleucon* Mordvilko 1914 (many species), *Pentamyzus* Hille Ris Lambers 1966 (3 species), *Blanchardaphis* Ortego, Nieto Nafría, and Mier Durante 1998 (2 species) and *Nietonafriella* Ortego 1998 (1

species). *Utamphorophora peruviana* (Esgig 1953), *Macrosiphum salviae* Bartholomew 1932, and *Wahlgreniella australis* Delfino 1981 may also be native. *Pentamyzus* is the only genus of these with species living on Poaceae or Rosaceae, which are very important plant families in the speciation of Aphidinae (Heie 1996, von Dohlen and Moran 2000).

Pentamyzus includes four known species: *P. acaenae* (Schouteden 1904) from Tierra del Fuego (Argentina); the type species *P. graminis* Hille Ris Lambers 1966 from California; and *P. falklandicus* Hille Ris Lambers 1974 and *P. tenuis* Brown 1987 both from the Falkland Islands. The last three species live on Poaceae and the first one was described on *Acaena splendens* Hook & Arn. (Rosaceae), but this record (Schou-

teden 1904) was considered doubtful by Hille Ris Lambers (1974) and Brown (1987), due to (1) the known biology of the other species of the genus, and (2) the presence of grass fragments in the specimen tube of the syntypes collected at San Pío Cape, Ushuaia in 1892. The four species are known only by their respective typical series (Schouteden 1904; Hille Ris Lambers 1966, 1974; Brown 1987).

MATERIALS AND METHODS

Supported by project LE20/99 (granted by the Regional Government of *Castilla y León*, Spain), four samples of *Pentamyzus* were collected in Tierra del Fuego (Argentina) by J.M. Nieto Nafría and M.P. Mier Durante:

1) On *Acaena splendens* (Rosaceae), Ushuaia: Tierra Mayor, 9.I.2000 [49 apterous viviparous females, 4 apterous males, and nymphs], see *P. acaenae*;

2) on *Acaena splendens* (Rosaceae), Ushuaia: Glacial Martial, 14.I.2000 [6 apterous viviparous females, 2 apterous oviparous females and nymphs], see *P. acaenae*;

3) on *Alopecurus magellanicus* var. *bracteolatus* (Phil.) M. C. Mariano (Poaceae), Río Grande, 12.I.2000 [288 apterous viviparous females, 4 apterous oviparous females, 26 apterous males, and nymphs]; see *P. tenuis* and the new species; and

4) on *Hordeum comosum* J. & C. Presl (Poaceae), Río Grande: San Pablo Cape, 12.I.2000 [192 apterous viviparous females, 4 apterous oviparous females and nymphs]; see the new species.

Abbreviations used in the text are as follows: ab.seg. = abdominal segment(s); ant.III, ant.IV = antennal segments III, IV; ant.Vb, ant.Vpt = base and processus terminalis of the antennal segment V; BL = body length; BW = body width; c. = cauda; D = basal diameter of ant.III; IAD = inter-antennal distance; h.tb. = hind tibia; h.t.II = second segment of hind tarsus; s. = siphunculus; u.r.s. = ultimate rostral segment.

RESULTS

Three species of *Pentamyzus* have been identified: (a) *P. acaenae* (Schouteden 1904) from samples 1 and 2; (b) *P. tenuis* Brown 1987, one viviparous female, from sample 3; and (c) a new species from samples 3 and 4.

Pentamyzus fueguinus Nieto Nafría, Mier Durante, and Ortego, new species (Figs. 1, 2B)

Apterous viviparous female (n = 413; 67 measured) (Table 1; Figs. 1A, 2B).—When alive reddish brown to greenish brown, oval in shape, and dorsally little convex and rigidly sclerotized; tergites of ab.seg. I to IV or V form a continuous plate, tergites of thoracic segments and ab.seg.VI, VII and VII free (sometimes separation metathorax-ab.seg.I and ab.seg.IV–V and abd.seg.V–VI not extending to marginal areas). Mounted specimens yellowish with distal $\frac{1}{4}$ – $\frac{1}{2}$ of antenna, u.r.s., and tarsi brown; well-pigmented specimens with other pigmented areas: parts of antenna, clypeus, third rostral segment, coxae and parts of femora and tibiae, intersegmental sclerites and marginal spots on prothorax to ab.seg.IV, plus slightly pigmented anal plate and siphunculi. Frontal tubercles conspicuous, lateral ones divergent and with 1–2 setae; medial one slightly displaced to ventral part of head. Dorsal cuticle sclerotized and more or less alveolated. Dorsal setae scarce, stiff, short and blunt, as antennal ones; ventral setae pointed, not too stiff, and longer than dorsal ones. Rostrum reaching middle coxae; setae long, pointed and flexible. Legs relatively short; with setae similar to dorsal ones, except: (1) tarsal setae pointed, and (2) ventral setae on femora and distal setae on tibiae pointed and longer than those, especially a group of 4 to 6 external and distal setae on tibiae, normally at most 0.5 times tibial width at this point. Proximal half of h.tb. with 0–4 (exceptionally to 9) scent plates placed inside. Abdominal papillae absent. Siphunculus slightly sigmoid and clavate.

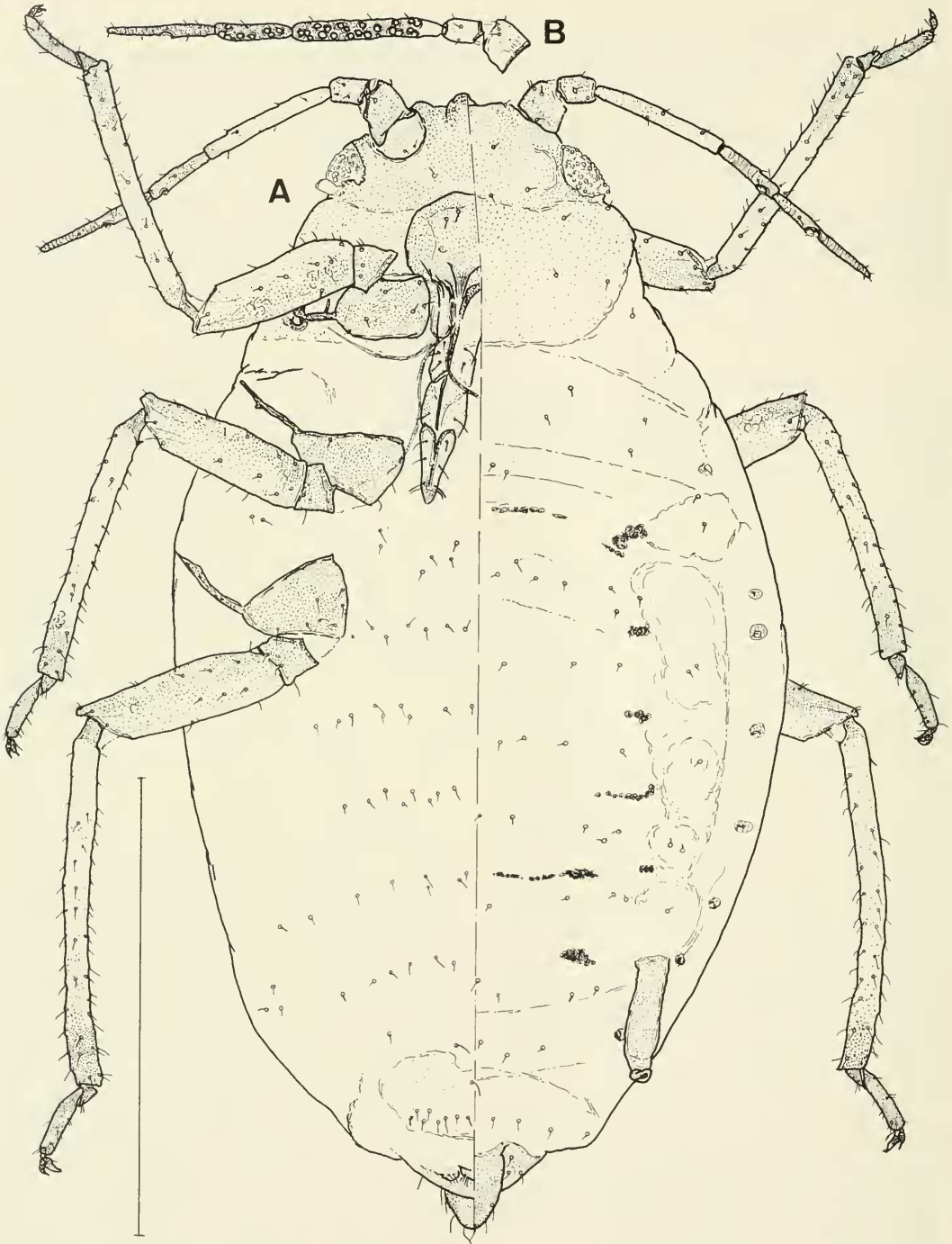


Fig. 1. *Pentamyzus fueguinus*. A, Apterous viviparous female, habitus, dorsal view to right and ventral view to left. B, Male, antenna. Scale bar = 1 mm. Illustration by M. Enrique Ortega Lorenzo (León, Spain).

with a cylindrical part at end and a well-developed flange; wrinkled at base, smooth on swollen part and striate on cylindrical distal neck. Subgenital setae relatively long and pointed. Gonapophyses conspicuous. Cauda more or less elongated-triangular with convex sides, with long, flexible and pointed setae. Metric and other meristic data in Table 1.

Alatae viviparous female.—Not known and probably does not exist. In material collected, several thousand nymphs and none of them alatoid.

Oviparous female ($n = 4$; 4 measured) (Table 1).—Very similar to viviparous female. Proximal half of h.tb. lightly swollen and with (exceptionally from 13) 20–44 scent plates, placed inside. Subgenital plate with (8)13–22 and 13–28 discal and posterior setae, respectively.

Apterous male ($n = 26$; 14 measured) (Table 1; Fig. 1B).—In life darker than female, with legs and antenna brown to black when alive. When mounted, heavily pigmented: ant.III to ant.Vpt, u.r.s., $\frac{1}{6}$ distal part of tibiae and tarsi dark brown, and head, rostrum, legs, intersegmental and stigmatic sclerites, siphunculi, genitalia and cauda smoked; several specimens with light pigmented marginal areas on pre-siphuncular segments and one transversal bar on ab.seg.VIII. Frontomedial tubercle ventral, larger than faint cephalic lateral ones, and nodulose as dorsal cuticle of thorax and abdomen. Similar in shape to male of *P. acaenae*, but with more alveolated and darker cuticle, especially on sclerotized areas. Ant.III and ant.IV with 41–77 and 13–30 (exceptionally ant.Vb with 4) small, round and striated-walled secondary sensoria.

Type material.—Holotype: apterous viviparous female (measured specimen number 2) collected on *Alopecurus magellanicus* var. *bracteolatus* at Río Grande (Tierra del Fuego Province, Argentina), 12.I.2000, in collection Universidad de León, Departamento de Biología Animal. Paratypes: other apterous viviparous females, oviparous females and males of studied material

samples 3 and 4, deposited in the authors' collections and in The Natural History Museum (London), Muséum National d'Histoire Naturelle (Paris), and Zoologisk Museum, Københavns Universitet (Copenhagen).

Etymology.—The specific name is from Tierra del Fuego, in masculine to agree with the gender of the genus.

Biology and distribution.—*Pentamyzus fueguinus* is a monoecious species with apterous males. Their biological cycle is short. Males and oviparous females and many male nymphs, which are recognizable by their brown or black appendages, were collected in early austral summer. Aphids form groups of 4 to 12 specimens on the outface of leaves of *Alopecurus magellanicus* var. *bracteolatus* and *Hordeum comosum*, which grow in moist areas near the Grande River and a little river on the beach at San Pablo Cape, respectively (this moist microhabitat is very similar to that reported by Hille Ris Lambers 1966 for *Pentamyzus graminis*). Grasses of dry neighboring environments are not colonized. We looked for the species without success on different grasses in moist and dry environments of the Argentinean Tierra del Fuego and Patagonia.

Pentamyzus acaenae (Schouteden 1904)
(Fig. 2A)

Apterous viviparous female (Table 1).—When alive light to green and very convex. Dorsum of body heavily sclerotized, nodulose and unpigmented; tergites of metathorax to ab.seg.VI form a continuous plate, tergites of ab.seg. VII and VIII mutually free. Very few metric differences have been observed with regard to types [Schouteden 1904], the only known specimens; these differences could be due to different collection dates, November and January, but different volume of samples must also be taken into account. Dorsal setae scarce, stiff, short and blunt; setae of antenna and legs similar in shape and in length, except (1) tarsal setae pointed, and (2) ventral setae of

Table 1. Metric and meristic data of *Pentamyzus fueguinus* and *P. acaenae*, apterous viviparous females (apt. viv. f.), oviparous females (apt. ov. f.) and males (apt. mal.). In square brackets in the apterous viviparous females column of *P. acaenae* are data from types.

	<i>Pentamyzus fueguinus</i>			<i>Pentamyzus acaenae</i>		
	apt. viv. f.	apt. ov. f.	apt. mal.	apt. viv. f.	apt. ov. f.	apt. mal.
BL (mm)	1.87–2.60	1.77–2.53	1.00–1.85	1.00–2.45	1.70–1.73	1.45–1.58
BL/BW	1.61–1.98	1.73–2.02	1.68–2.23	[1.48] 1.54–1.88	1.60–1.70	1.93–2.17
antenna (mm)	0.72–1.13	0.80–1.00	0.82–0.98	0.66–1.21	0.67–0.72	1.05–1.33
antenna/BL	0.32–0.54	0.33–0.53	0.45–0.56	0.35–0.55	0.39–0.42	0.71–0.84
ant.III (mm)	0.26–0.48	0.27–0.39	0.31–0.40	0.24–0.48	0.23–0.24	0.44–0.54
ant.IV (mm)	0.12–0.24	0.14–0.19	0.16–0.21	0.12–0.23	0.11–0.13	0.23–0.32
ant.Vb (mm)	0.10–0.15	0.11–0.15	0.11–0.15	0.09–0.17	0.10–0.12	0.12–0.16
ant.Vpt (mm)	0.09–0.17	0.11–0.17	0.09–0.13	0.07–0.18	0.08–0.11	0.11–0.16
IAD/ant.III+IV	0.28–0.55	0.31–0.50	0.34–0.43	0.29–0.52	0.51–0.52	0.22–0.26
ant.III/ant.IV	1.90–2.36	1.52–2.36	1.70–2.16	1.88–2.35 [2.40]	1.88–2.09	1.68–1.94
ant.III/ant.Vpt	2.03–3.50	2.20–2.79	2.64–3.74	2.66–4.14	2.23–2.83	3.49–4.05
ant.Vpt/ant.Vb	0.69–1.48	0.84–1.17	0.83–1.13	0.68–1.09 [1.30]	0.85–0.88	0.89–0.97
rostrum (mm)	0.35–0.50	0.35–0.50	0.40–0.53	0.35–0.48	0.36–0.40	0.35–0.44
BL/rostrum	2.00–3.47	2.36–2.93	1.76–2.56	2.64–3.20	2.50–2.97	1.71–2.07
u.r.s. (mm)	0.12–0.17	0.12–0.17	1.13–0.16	0.12–0.15	0.12	0.11–0.12
u.r.s./basal width	1.93–2.54	1.71–2.21	1.92–3.22	1.84–2.64	1.84–1.85	2.00–2.40
u.r.s./h.t.II	0.93–1.18	0.86–1.36	0.90–1.07	0.96–1.18	1.09–1.20	0.92–0.96
hind femur (mm)	0.37–0.50	0.37–0.50	0.37–0.45	0.30–0.50	0.30–0.33	0.32–0.43
h.tb. (mm)	0.62–0.93	0.62–0.85	0.62–0.78	0.50–0.98	0.52–0.55	0.70–0.80
h.t.II (mm)	0.11–0.17	0.11–0.16	0.13–0.17	0.10–0.15	0.10–0.11	0.12–0.13
s. (mm)	0.21–0.39	0.25–0.35	0.20–0.25	0.22–0.43	0.25–0.27	0.25–0.28
s./BL	0.09–0.16	0.10–0.19	0.11–0.14	0.12–0.19	0.14–0.16	0.16–0.19
s./ant.III	0.69–0.87	0.78–0.91	0.57–0.71	0.67–1.67	1.04–1.15	0.48–0.56
s./its maximal width	3.12–4.88	3.33–4.67	2.50–4.08	2.75–5.38	3.33–4.16	3.47–4.91
widest/thickest siphun- cular width	1.15–1.67	1.08–2.14	1.44–3.00	1.18	1.30–2.50	1.44–1.86
s./c.	1.07–1.45	1.25–1.56	1.53–2.45	1.02–1.59	1.16–1.42	1.62–1.93
c. (mm)	0.11–0.28	0.16–0.23	0.10–0.14	0.19–0.30	0.19–0.22	0.14–0.16
c./its basal width	0.77–1.81	0.86–1.57	0.80–1.30	1.15–2.00	1.46	1.27–1.40
setae on						
vertex (μm)	12–18	7–13	12–18	10–23	10–15	20–25
vertex (times D)	0.6–0.9	0.3–0.7	0.5–0.9	0.5–1.0	0.6–0.7	1.0–1.5
ant.seg.III (μm)	10–18	10–15	10–18	10–18	10	10–15
ant.seg.III(times D)	0.4–0.8	0.4–0.8	0.4–1.0	0.6–1.0	0.5–0.7	1.1–1.3
ab.seg.I–V (μm)	10–15	10–18	10–15	7–18	12–13	12–18
ab.seg.I–V (times D)	0.4–0.9	0.5–0.8	0.5–0.8	0.4–0.9	0.6	0.7–1.2
ab.seg.VII (μm)	10–15	10–13	10–15	10–15	10–15	17–20
ab.seg.VII (timesD)	0.5–0.8	0.5–0.8	0.5–0.7	0.5–1.0	0.6–0.8	0.8–1.2
ab.seg.VIII (μm)	12–23	12–20	12–20	15–28	12–28	20–25
ab.seg.VIII(times D)	0.6–1.3	0.5–1.0	0.6–1.0	0.7–1.7	0.8–1.4	1.1–1.5
setae number on						
head	15–29	17–28	16–34	15–27	20	15–25
ant.III	4–13	6–9	4–10	4–11	5–6	3–7
ant.IV	2–6	2–5	1–4	1–4	2–3	1–3
ant.Vb	0–5	2–4	2–5	(0)1–4	2–3	3–4
u.r.s. (compl.)	2–4(5)	2–4	(1)2–4	2–4	2–4	4
tarsal seg.I	3:3:2–3	3:3:2–3	3:3:2–3	3:3:2	3:3:2	3:3:2
ab.seg.I–V	4–15	4–11	4–10	4–11	7	4–10
ab.seg.VII	4–10	7–14	4–8	4–9(12)	7	4–6
ab.seg.VIII	4–11	4–9	4–8	4–8(12)	6–7	4–6
c.	4–11	5–8	4–7	6–10	5–6	5–9
subgenital plate						
(discal)	2–8(10)	8–22	—	(0)2–4(6)	10–16	—
(posterior)	10–22	13–28	—	7–18	16	—

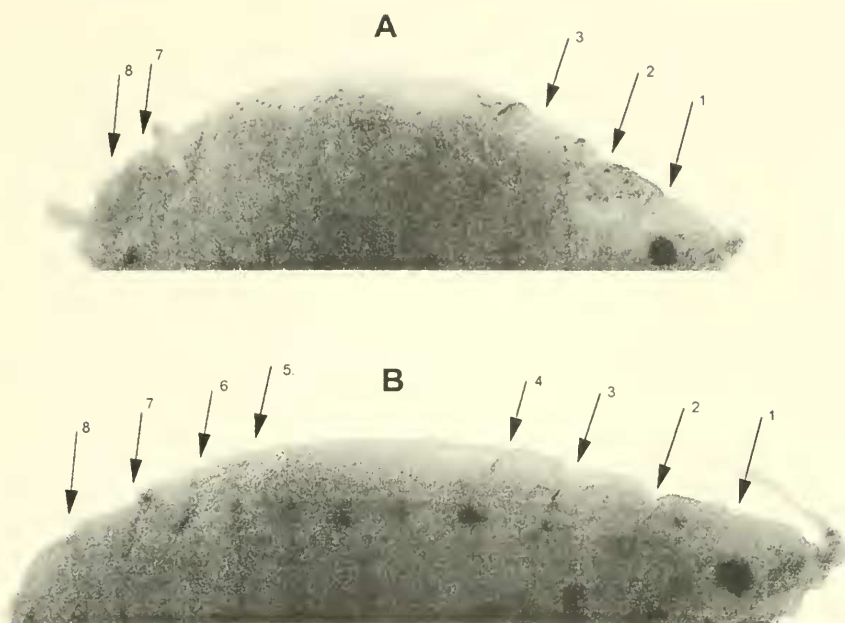


Fig. 2. Apterous viviparous female. A, *Pentamyzus acaenae*. B, *P. fueguinus*. Head-prothorax (1), prothorax-mesothorax (2), mesothorax-metathorax (3), metathorax-ab.seg.I (4), ab.seg.IV-ab.seg.V (5), ab.seg.V-ab.seg.VI (6), ab.seg.VI-ab.seg.VII (7), ab.seg.VII-ab.seg.VIII (8) intersegmental lines.

femora and distal setae of tibiae pointed and longer than those, especially a group of 4 to 8 external and distal on tibiae, normally at least 0.5 times tibial width at this point. Ventral setae pointed and flexible and longer than dorsal ones.

Apterous oviparous female (previously undescribed) (Table 1).—Very similar to viviparous female. With group of 8–16 scent plates on an internal small swollen area at proximal half of h.tb. Subgenital plate with 10–16 discal setae and 16 posterior setae.

Apterous male (previously undescribed) (Table 1).—Green, but darker than female, with smoked head and legs when alive; pigmentation similar to male of *P. fueguinus* when mounted; dorsal cuticle of thorax and abdomen less nodulose as male of *P. fueguinus*. Ant.III, ant.IV and ant.Vb respectively with 61–73, 25–32 and 0–1 secondary sensoria, similar to those new species.

Biology and distribution.—*Pentamyzus acaenae* is a monoecious species, with apterous males. Its life cycle is very short. Sexuales occur in the first month of the aus-

tral summer and winged viviparous females possibly do not exist (alatoid nymphs have not been observed). Aphids live on the leaves or shoots of the rosaceous *Acaena splendens*, which is very common in the deciduous forest of the mountainous area of the southern half of Tierra del Fuego; this plant and other species of *Acaena* exist in other areas of Argentinean Tierra del Fuego and Patagonia, but the aphid has not been recorded there.

Pentamyzus tenuis Brown 1987

Pentamyzus tenuis is a very peculiar species (the body is elongated and the front is convex). We collected one female, which is similar in general to the types (two viviparous females and two nymphs), but some differences have been observed (Table 2). The host plant in Tierra del Fuego is not the typical host plant, *Poa alopecurus* Kunth. (Brown 1987). The presence of this aphid in South America, at a locality situated approximately eight degrees to the west and two degrees to the south of the

Table 2. Metric and meristic data of apterous viviparous females of *Pentamyzus tenuis* from Falkland Islands and Tierra del Fuego.

	Falkland I.	T. del Fuego		Falkland I.	T. del Fuego
BL (mm)	2.36–2.56	2.87	h.t.II (mm)	0.09–0.10	0.12
BL/BW (times)	2.5–2.7	3.11	s. (mm)	0.18–0.19	0.20
ant.III (mm)	0.14–0.25	0.19	s./ant.III (times)	1.2–1.3	1.1
ant.IV (mm)	0.06–0.07	0.08	scent plates, number	—	1–2
ant.Vb (mm)	0.09–0.10	0.13	cephalic setae, number	50	56
ant. Vpt (mm)	0.06–0.07	0.10	cephalic setae (μm)	20	33
ant.III/ant.Vpt (times)	2.14–2.33	1.95	ant.III setae/D (times)	1.0–1.3	1.4
h.tb. (mm)	0.30–0.31	0.38	ab.VIII setae (μm)	30–40	43

typical locality, is not surprizing. In all cases, the species must be very scarce with four specimens from the East Falkland Island and only one from Tierra del Fuego, and this one was found in the laboratory together with more than 300 specimens of *Pentamyzus fueguinus*.

DISCUSSION

Taxonomy

Without doubt, *Pentamyzus* belongs to Macrosiphini, although the ratio 'ab.seg.I-ab.seg.II spiracles distance': 'ab.seg.II-ab.seg.III spiracles distance' is too great. Our data show 0.39–0.63 times in *P. tenuis* ap.viv.f. (Brown 1987 and our data), 0.40–0.65 times in *P. acaenae* all morphs, and (0.31)0.46–0.58(0.67) times in *P. fueguinus*. According to Hille Ris Lambers (1966), the closest genus to *Pentamyzus* is *Glabromyzus* Richards 1960 which, according to Footit and Richards (1993), also has a sclerotic and alveolated dorsum, moderately sized frontal tubercles, clavate siphunculi, and short and blunt dorsal and antennal setae, but it has six-segmented antennae, longer cauda, and is dioecious (primary host, *Rhus*; secondary host, Cyperaceae, Poaceae, and Juncaceae). The venation of the anterior wings is also different with three medial branches in *Glabromyzus* and two in *P. graminis*, the only species of *Pentamyzus* with known alata.

Pentamyzus fueguinus is a well-characterized species by the presence of apterous

males, and it can be separated from other species of *Pentamyzus* using the following key for the apterous viviparous females, which is based on the key by Brown (1987).

1. Body strongly elongated (BL at least 2.5 times BW). Frontal tubercles absent, frons convex. Antenna short (IAD is at least 1.07 times ant.III+ant.IV). Dorsum with polygonal glandular facets on well-pigmented sclerotic dorsal areas. Dorsal setae pointed [On *Poa alopecurus* and *Alopecurus magellanicus*. Falkland Islands; Tierra del Fuego] *P. tenuis*
- Body oval or oval-elongate (BL at most 2.0 times BW). Medial and lateral frontal tubercles present. Antenna relatively long (IAD at most 0.6 times ant.III+ant.IV). Dorsum with no polygonal glandular facets, largely sclerotic and more or less alveolated or nodulose. Dorsal setae blunt 2
2. Ant.III 1.3–1.6 times ant.IV. U.r.s. at most 0.07 mm and 0.80 times h.t.II and without complementary setae. Siphunculus slightly clavate or cylindrical, without enlarged flange [On unidentified grasses. California] *P. graminis*
- Ant.III 1.8–2.6 times ant.IV. U.r.s. at least 0.12 mm and 0.80 times h.t.II and with 2–4 (exceptionally 1 or 5) complementary setae. Siphunculus clavate, with enlarged flange and opening outside 3
3. Ant.Vpt at least 0.25 mm and 1.50 times Vb. U.r.s. shorter than 0.90 times h.t.II. Siphunculus without narrow cylindrical neck between swelling and bad definite flange, and 1.56 times BL at least. Marginal papillae sometimes present on ab.seg.II to ab.seg.IV [On *Paradiachloa flabellata*. Falkland Islands] *P. falklandicus*
- Ant.Vpt at most 0.19 mm and 1.52 times Vb. U.r.s. longer than 0.90 times h.t.II. Siphunculus with a narrow cylindrical neck between swell-

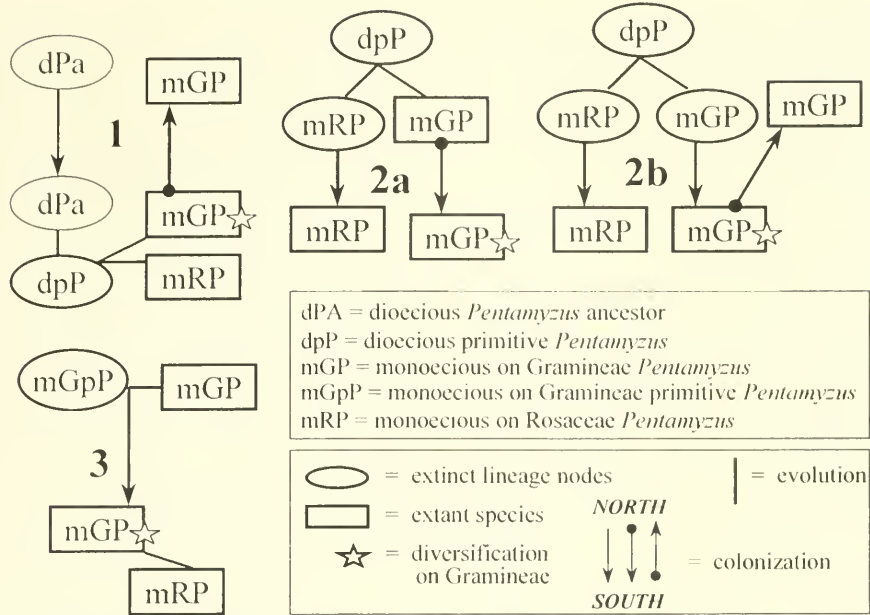


Fig. 3. Hypothesis on the origin and diversification of *Pentamyzus*.

- ing and well definite flange, and 1.60 times BL at most. Marginal papillae not present on abdominal segments 4
4. Green and very convex aphids living on rosaceous herbs. Tergites of metathorax to ab.seg.VI form a continuous sclerotized plate, tergites of prothorax, mesothorax and ab.seg.VII and VIII free (Fig. 2A). Distal and external setae of h.tb. normally longer than 0.5 times h.tb. width at seta insertion point [On *Acaena splendens*, Tierra del Fuego, southern slopes of the Andes] *P. acaenae*
- Brown aphids living on grasses. Tergites of ab.seg.I to IV or V forming a continuous plate, while tergites of thoracic segments and ab.seg.VI to VIII free (Fig. 2B). Distal and external setae of h.tb. normally shorter than 0.5 times h.tb. width at seta insertion point [On *Alopecurus magellanicus* and *Hordeum comosum*, Tierra del Fuego, North of the Andes] *P. fueguinus*

Pentamyzus tenuis has a body shape very different from the other species of the genus with no developed frontal tubercles, glandular formations, or pointed dorsal setae, but it has the five-segmented antennae, the clavate siphunculi, and lives on grasses which are reasons not to establish a new genus level taxon.

The absence of winged viviparous fe-

males in the South American species could be related to the fact that they live in very windy areas.

PHYLOGENY AND BIOGEOGRAPHY

The presence and relative richness of *Pentamyzus* in the “far south” of South America (including the Falkland Islands, as they are situated on the continental platform) is evident. The presence of *P. graminis* in California shows a very enlarged discontinuous distribution of the genus. This known distribution could be unreal because extended areas of South America are not well studied, although we have looked for aphids in Andean areas of several Argentinean provinces and interesting mountain areas of Mexico are well surveyed (Remaudière, personal communication). In our opinion, there are three possibilities (Fig. 3) to explain the origin and diversification of *Pentamyzus*.

(1) *Pentamyzus* appeared in South America as a member of a lineage of Macrosiphini which emigrated from North America and more recently one species (as far as we know) returned to North America,

to California. The primitive *Pentamyzus* may have been dioecious, as its ancestor. Later, it diversified into two monoecious sublineages, one rosaceous-feeding and another grass-feeding. The sublineage on Rosaceae finally established itself on herbaceous ones, because there are no other autochthonous rosaceans species in the far south (this is not surprising in monoecious aphids, for example *Chaetosiphon fragaefolii* (Cockerell 1901), *Amphorophora gei* (Börner 1939), or *Acyrtosiphon boreale* Hille Ris Lambers 1952 [Macrosiphini] living on Rosaceae herbaceous species), and *P. acaenae* belongs to this sublineage. The other known *Pentamyzus* species belong to the other sublineage; in this group the most different species are: (i) *P. tenuis*, which has a elongated body and is South American, and (ii) *P. graminis*, which has several derivative characteristics such as small-clavate siphunculi, lack of complementary u.r.s. setae, and lack of marginal papillae (this last characteristic is also present in other species of the genus) and belongs to the returned lineage.

(2) The primitive dioecious *Pentamyzus* stock was North American, and host diverging originated in North America. Later, two sublineages colonized South America via the Andes. Here we found two possibilities: (2a) The northern species on Rosaceae disappeared, *P. acaenae* belongs to the rosacean sublineage established in the South, *P. graminis* belongs to the old northern grass sublineage, and *P. falklandicus*, *P. fueguinus*, and *P. tenuis* belong to the southern grasses sublineage; or (2b) all northern species disappeared and *P. graminis* returned from South America, such as in hypothesis 1.

(3) *Pentamyzus* was a North American monoecious and grass-feeding genus. Later it colonized South America, and one sublineage (represented by *P. acaenae*) acquired *Acaena* as a host. As in hypothesis 2, there are two possibilities with regard to *P. graminis*: (i) it belongs to the non-displaced old-lineage (in Fig. 3), or (ii) it is

the last species of a lineage which returned from South America.

The three hypotheses are concomitant with the present theory on the colonization of South America by the Aphidinae (the Holarctic origin of this subfamily and its subordinated taxa, such as Macrosiphini, is generally accepted, Heie 1996). South America was invaded in different waves by different lineages of this tribe (so *Microparsus*, *Pentamyzus* and siphunculi-reticulated aphids, such as *Uroleucon*, *Nietonafriella*, and *Blanchardaphis*, belong to different generic groups and live on plants of different families, the first one on Fabaceae and last three on Asteraceae).

The three hypotheses may be correct, but we prefer 1 or, to a lesser extent, 3, because they are the most parsimonious when explaining the morphological similarities between *P. fueguinus* and *P. acaenae* and the presence of two "special" grass-feeding species, *P. tenuis* (because of its body appearance) and *P. graminis* (because its derivative characteristics and distribution). In either case, only molecular analysis could allow us to arrive at a conclusion as to which of these hypotheses is correct.

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